

## Appendix C: Technical Appendix

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Appendix C provides additional information on a number of issues related to monitoring progress in Healthy People 2010:

- **Measuring progress toward target attainment**—procedures used to measure progress toward the targets for Healthy People 2010 objectives and subobjectives.
- **Measuring quality and years of healthy life**—procedures used to measure these concepts in connection with the first goal of Healthy People 2010.
- **Measuring health disparities**—procedures used to measure disparities among populations in connection with the second goal of Healthy People 2010.
- **DATA2010**—description of the online database for Healthy People 2010 objectives and subobjectives.
- **Target adjustment**—procedures used to revise targets for some Healthy People 2010 objectives.
- **Tracking Healthy People 2010**—updated guide to measurement issues in Healthy People 2010.

### Measuring Progress Toward Target Attainment

Progress toward the target for each objective in Healthy People 2010 is measured using the progress quotient, or percent of targeted change achieved. The progress quotient expresses any change from the baseline relative to the initial difference between the baseline and the target. The progress quotient also was used to monitor progress in Healthy People 2000.<sup>1,2</sup>

Baseline data values were published at the beginning of the decade for Healthy People 2010 objectives and subobjectives for which data were available.<sup>3</sup> Baseline data for additional objectives and subobjectives have become available since the publication of *Healthy People 2010*.<sup>4</sup>

#### Progress Quotient Chart

The progress quotient (PQ) measures the percent of the targeted change that was achieved. It is a relative measure because it expresses any change between the baseline and the most recent value as a percent of the difference between the baseline and the 2010 target. The comparability of the PQ does not depend on whether the measure is expressed in terms of adverse or positive outcomes. Data beyond the baseline are available for about 53 percent of the objectives and subobjectives in Healthy People 2010. The formula for the PQ is as follows:

$$PQ = (\text{most recent value} - \text{baseline value}) / (\text{year 2010 target} - \text{baseline value}) \times 100$$

For example, school-based objective 7-2c calls for an increase in the proportion of middle, junior high, and senior high schools that provide education to prevent violence from a baseline of 58 percent in 1994 to a target of 80 percent in 2010. In 2000, 73 percent of schools provided education to prevent violence. With the use of the formula above, 68 percent of the difference between the baseline and the 2010 target had been achieved in 2000.

$$PQ = (73 - 58) / (80 - 58) \times 100 = 68 \text{ percent}$$

For the population-based objectives, the PQ also can be used to measure progress toward the target for each population group with data beyond the baseline. For example, the PQ for objective 16-1c to reduce infant death to 4.5 infant deaths per 1,000 live births in 2010 can be computed for the total population between the 1998 baseline (7.2) and 2002 (7.0). When the formula above is applied, 7 percent of the difference between the baseline and the 2010 target had been achieved for the total population in 2002.

$$PQ = (7.0 - 7.2) / (4.5 - 7.2) \times 100 = 7 \text{ percent}$$

In contrast, among infants of Asian women, the infant death rate declined from 5.0 at the baseline in 1998 to 4.1 in 2002. With the formula above, 180 percent of the difference between the baseline and the year 2010 target had been achieved in 2002.

$$PQ = (4.1 - 5.0) / (4.5 - 5.0) \times 100 = 180 \text{ percent}$$

In this example, the PQ indicates that the target was exceeded by 80 percent of the difference between the baseline and the target.

The PQ is positive when the rate moved toward the target and negative when the rate moved away from the target. The PQ can be used to compare progress for one objective, relative to its baseline, with progress for other objectives, relative to their baselines.

There are some limitations to the interpretation of the PQ statistic. First, the PQ measures the observed difference between the baseline year and the most recent year only. Fluctuations in the measure during the intervening years are not considered. This variability can cause substantial fluctuations in the size of the PQ from year to year. Second, the number of years between the baseline year and the final data year for Healthy People 2010 might be different both between objectives and within objectives. Between objectives, differences in the number of years available to meet targets are a function of data sources and choices made regarding the most appropriate baseline year for a particular objective. To assist the reader in the interpretation of these comparisons, the baseline data year and the most recent data year for each objective are shown in parentheses in the PQ charts for each focus area. Within objectives, differences in the number of years available to meet targets for specific groups within the population template can be affected by changes in the classification of race during the tracking period. In these cases, the period used to compute the PQ is the same as that used to measure disparities. (See the section on Measuring Health Disparities for more details.) Third, the absolute change required to attain the target might differ among select populations or across objectives and/or subobjectives with identical PQs. Therefore, equal PQs do not reflect equal absolute progress from the baseline. Fourth, estimates of the variability of the PQs are not included in the midcourse review because of lack of standard errors of the estimates for some objectives. Estimates of variability for the PQs are expected to be available for the final review at the end of the decade.

In addition to the above limitations, there are a small number of cases in which the PQ could not be calculated or did not accurately reflect change in an objective. Four example cases are as follows:

1. Target met at baseline, movement in a positive direction:

Target = 5, Baseline = 5, Most recent data point = 4

$$PQ = (4 - 5) / (5 - 5) \times 100 = -1 / 0 \times 100$$

Cannot divide by 0.

2. Target met at baseline, movement in a negative direction:

Target = 0, Baseline = 0, Most recent data point = 2

$$PQ = (2 - 0) / (0 - 0) \times 100 = 2 / 0 \times 100$$

Cannot divide by 0.

3. Target exceeded at baseline, further progress beyond target:

Target = 30, Baseline = 35, Most recent data point = 40

$$PQ = (40 - 35) / (30 - 35) \times 100 = 5 / -5 \times 100 = -100\%$$

Here, progress was made, but the result of the calculation appears to indicate movement away from the target.

4. Target exceeded at baseline, movement in a negative direction:

Target = 30, Baseline = 35, Most recent data point = 25

$$PQ = (25 - 35) / (30 - 35) \times 100 = -10 / -5 \times 100 = 200\%$$

Here, progress was not made, but the result of the calculation appears to indicate the target was exceeded.

In the figures for each focus area, objectives like examples 1 and 3 are shown with arrows in the positive direction, with the value “100+%” indicating that the target was exceeded. Objectives like examples 2 and 4 are shown with arrows in the negative direction. In all cases, a footnote indicates that the precise amount could not be calculated.

Finally, when the targeted amount of change was small relative to the actual amount of observed change, the PQ can produce relatively large values that are difficult to interpret.

## Measuring Quality and Years of Healthy Life

Goal 1 of Healthy People 2010 is to increase the quality and years of healthy life. This goal is tracked with three summary measures of health that belong to the family of measures called “healthy life expectancy.” The measures are (1) expected years of life in good or better health, (2) expected years of life free of activity limitation, and (3) expected years of life free of selected chronic diseases. The measures are given in life-years, which indicate the average number of healthy years a person can expect to live if age-specific death rates and age-specific illness rates remain the same throughout his or her

lifetime. Thus, healthy life expectancy is a “snapshot” of current death and illness patterns and can illustrate the long-range implications of the prevailing age-specific death and illness rates. The methods used to create the healthy life expectancy measures are described here.

## Methods

The healthy life expectancies used in the midcourse publication are calculated using a double-decrement life table technique that is based on the Sullivan method.<sup>5,6</sup> A traditional life table presents what would happen to a hypothetical cohort if it experienced exactly the same age-specific death rates during a given period of time. (See Anderson<sup>7</sup> for information about calculating a life table.) A double-decrement life table analyzes what would happen to a hypothetical cohort if it experienced exactly the same age-specific death *and* age-specific illness rates during a given period of time. Although it is possible to create life tables based on single years of age, this analysis uses an abridged life table, with age intervals of 5 years.

To produce healthy life expectancies, age-specific death rates are combined with age-specific health prevalence rates to produce an estimate of overall healthy life expectancy. (See Molla et al.<sup>8</sup> for details on calculating healthy life expectancy.)

The following terms are used as column headings in a life table:

- *qx*—*probability of dying*—This column shows the probability of dying during the age interval. The probability is derived from death rates for a given year.
- *lx*—*number surviving*—This column shows the number of persons from birth surviving to the beginning of the next age interval. The life table typically begins with a population at birth of 100,000 called the *radix*.
- *dx*—*number dying*—This column shows the number of deaths in each age interval out of the original 100,000 births. It is calculated by multiplying the *qx* for the age interval by the *lx* for the same age interval.
- *Lx*—*person-years lived*—This column shows the total time lived (in years) within the age interval by all of those who have survived to the beginning of the age interval.
- *Tx*—*total number of person-years lived*—This column shows the total number of person-years that would be lived after the beginning of the age interval.
- *Ex*—*expectation of life*—This column shows the average number of years remaining to be lived by those surviving to the age interval. It is derived by dividing the total number of person-years lived at the age interval and above by the number surviving to the beginning of the age interval ( $Tx/lx$ ).

Life tables used to calculate healthy life expectancy contain all of the columns described above, as well as the following columns of terms that refer to illness:

- *Px*—*age-specific illness rate*—This column shows the percentage of persons in the age interval in a given poor health state.
- $Px \times Lx$ —*healthy person-years lived*—This column shows the number of healthy person-years lived during the age interval. This number is derived by multiplying the age-specific illness rate by the corresponding number of person-years lived during the age interval (*Lx*).
- *THx*—*total number of healthy person-years lived*—This column shows the total number of healthy person-years that would be lived after the age interval.

- *HLE<sub>x</sub>—expectation of healthy life*—The expectation of healthy life is the average number of years in good health remaining for those surviving to a given age with a given set of age-specific death rates and age-specific illness rates. It is derived by dividing the total healthy person-years that would be lived at age  $x$  by the total number of persons who survived to that age interval ( $TH_x/l_x$ ).

The use of healthy life expectancies allows for easy comparisons across populations, as well as over long periods of time. The use of the Sullivan method for estimating healthy life expectancies is most appropriate for the cross-sectional data used to track Healthy People 2010.<sup>9</sup>

## Data Systems

Analyses are based on the 1999–2000 and 2001–02 death data from the National Vital Statistics System (NVSS) and 1999–2000 and 2001–02 health data from the National Health Interview Survey (NHIS). Two years of data were used to improve the stability and reliability of the sample survey health data from NHIS. NHIS is a nationally representative continuing cross-sectional survey that provides a “snapshot” of the health of the U.S. population. Approximately 40,000 households are interviewed each year. NVSS is a complete registration of all vital events and includes detailed data on all of the deaths that occur within the United States.

These data systems are used for the study of healthy life expectancy because they contain detailed information on health and death. However, the institutionalized population is excluded from the NHIS sample. Because the institutionalized population is more likely to report poor health, the Healthy People 2010 healthy life expectancy measures might underestimate the effect of poor health on healthy life expectancies.

## Survey Questions

*Self-rated health status* is measured by the single question from NHIS that asks respondents to rate their health as “excellent,” “very good,” “good,” “fair,” or “poor.” For the purpose of determining Healthy People 2010 healthy life expectancy, a respondent is considered to be in poor health if he or she answers “fair” or “poor.” This self-assessed health rating has been validated as a useful indicator of one’s actual health for a variety of populations and allows for broad comparisons across different conditions and populations.<sup>10</sup> The measure also is included in the Behavioral Risk Factor Surveillance Survey, the National Health and Nutrition Examination Survey, and other health surveys.

*Activity limitation* is measured using questions about personal care needs, limitations of activities, and use of special equipment. Adults are asked whether they need assistance with personal care needs, such as eating, bathing, dressing, or getting around inside the home; whether they need assistance with routine care needs, such as household chores; and whether they have a mental or physical problem that keeps them from working at a job or limits their activity in any way. They also are asked whether they have health problems that require the use of special equipment, such as a cane, wheelchair, or special telephone. If a respondent answers “yes” to any of these questions, he or she is classified as having activity limitations. Children are considered limited in activity if the proxy adult respondent responds “yes” to any of the limitation, special services, or special equipment questions that are specific to children.

*Selected chronic disease prevalence* is measured by several questions that ask respondents whether a doctor has ever diagnosed them with a given disease. The list of selected chronic diseases represents

those chronic diseases included in Healthy People 2010 and NHIS: arthritis, asthma, cancer, diabetes, heart disease, high blood pressure, kidney disease, and stroke. Thus, the current measure might underestimate the contribution of chronic disease to healthy life expectancy because all chronic diseases are not included. Additional chronic disease measures might be added in the future if they are supported by a nationally representative data source. If a respondent answers “yes” to any of the selected diagnoses, he or she is classified as having a chronic disease. For children, not all of the selected chronic diseases have the same relationship to risk of death, and ideally such a healthy life expectancy would adjust for the severity of the disease. However, NHIS does not collect data on the severity of the disease.

### **Healthy People 2000**

The 2010 healthy life expectancy measures differ from the measure used for Goal 1 of Healthy People 2000. The Healthy People 2000 measure combined information about death, self-rated health, and activity limitations into a single measure known as years of healthy life.<sup>6</sup> For Healthy People 2010, these illness components have been separated into distinct measures. This strategy allows for greater ease in interpreting change and determining the mechanisms of change. The same double-decrement life table technique used in Healthy People 2000 is used to create the healthy life expectancy measures for Healthy People 2010.

### **Limitations**

Healthy life expectancy is computed using the Sullivan method, the standard method for computing healthy life expectancy on a routine basis. Although the Sullivan method accurately depicts the current status of the population’s health, it does not reflect the underlying transitions into and out of poor health states. In other words, the Sullivan method assumes that if a respondent reports an activity limitation at a given point in time, that respondent is limited in activities for the rest of his or her life. However, this case is very unlikely. As the underlying disease processes progress and retreat over time, poor health states also progress and retreat. For example, a person diagnosed with cancer at a given point in time might experience remission and better health states in the future. The Sullivan method does not account for future years of good health for such a person.

In addition, the Sullivan method can be biased when evaluating trends over a short period of time. Biases in trends of healthy life expectancy can occur if there are fluctuations in health over a short time period. The Sullivan method is less likely to give misleading estimates of trends in healthy life expectancy when changes in death rates and health status rates are smooth and relatively even.

### **Future Plans**

Identifying the best approaches for measuring quality and years of healthy life is an evolving field. The three summary measures selected for use in Healthy People 2010 will provide trend data for the final review at the end of the decade. Future research will build upon these initial measures of healthy life expectancy. It would be desirable to include measures that account for the contribution of mental health status to quality of life and other health variables. In addition, the Healthy People 2010 healthy life expectancy measures are expected to be expanded to include expected years of life with good health behaviors.

Goal 1 of Healthy People 2010 challenges the Nation to assess and measure the complex interactions of health, disease, disability, and premature death in order to increase quality of life and years of healthy life. Refining summary measures of population health, expanding data collection, and implementing effective



disease prevention and health promotion interventions will likely assist in making effective progress on this goal by the end of the decade.

## Measuring Health Disparities

The second overarching goal of Healthy People 2010 calls for eliminating health disparities among segments of the population, including differences that occur by race or ethnicity, gender, education or income, geographic location, disability, or sexual orientation.<sup>3</sup> These characteristics are applicable to objectives that measure aspects of the health of the population and do not apply to objectives that are based on schools, worksites, States, or other nonpopulation units of measures. Information about disparities for the population-based objectives is provided in the second figure in each focus area section. These disparities tables summarize information about the size of disparities at the most recent data point and changes in disparities over time for each population-based objective and each relevant characteristic.

The methods used to create the disparities tables are described here. The information in the tables is summarized in the Executive Summary under Goal 2: Eliminate Health Disparities. The rationale for methods used in measuring disparity in Healthy People 2010 is provided in a previous report.<sup>11</sup>

### Measuring Objectives and Defining Groups

Technical information concerning the measurement of each objective and the classification of the population characteristics used in monitoring the objectives is provided in *Tracking Healthy People 2010*.<sup>12</sup> The original classification of racial and ethnic groups shown in *Healthy People 2010*<sup>3</sup> was altered based on revisions to the standards for the classification of Federal data on race and ethnicity that were published by the Office of Management and Budget in 1997.<sup>13</sup> These standards allow each person to identify with only one race or with more than one race. The race and ethnicity categories used to monitor the Healthy People 2010 population-based objectives were modified, and the resulting categories are as follows:

- American Indian or Alaska Native
- Asian
- Native Hawaiian or other Pacific Islander
- Black or African American
- White
- Two or more races
  - American Indian or Alaska Native; white
  - Black or African American; white
- Hispanic or Latino
- Not Hispanic or Latino
  - Black or African American
  - White

Federal data systems have been revising their collection and tabulation procedures to comply with the new standards on racial and ethnic identification. Some data systems began reporting data for calendar year 1999 using the new standards. Other data systems are still in the process of adopting the revised standards. Consequently, the availability of comparable data for racial and ethnic groups varies by data

source and across objectives. DATA2010, the interactive online database containing the baseline and tracking data for the Healthy People 2010 objectives, is adding data for the new categories as soon as they become available. Seven racial and ethnic groups are shown in the disparity tables in this report: American Indian or Alaska Native, Asian, Native Hawaiian or other Pacific Islander, two or more races, Hispanic, white non-Hispanic, and black non-Hispanic. The first four groups might include small numbers of persons of Hispanic origin. The data systems used to track the population-based objectives in Healthy People 2010 might not provide data for all of these groups. Departures from this classification scheme are indicated by footnotes in the disparity table for each focus area.

To maintain comparability of data by race and ethnicity over time for some objectives, a more recent data year might be used as the baseline because of the revised standards.<sup>9</sup> For example, NHIS began reporting data according to the new racial and ethnic categories in 1999. Although the baseline year for objectives tracked with NHIS might be 1997 or 1998, data for 1999 are used as the baseline for measuring disparities for race and ethnicity data only. These departures are indicated by footnotes in the disparities table for each focus area.

### **Availability of Data**

The data used to monitor the Healthy People 2010 objectives come from a wide variety of data systems. Data for a particular population group might not be available because they are not collected by the data system, because they have been collected but not analyzed, or because they are suppressed. Data are suppressed when the number of events is too small to produce reliable estimates, when disclosure might violate confidentiality requirements, when the sample design does not produce representative estimates for a particular group, or when there is high item nonresponse or a large number of “unknown” entries. Criteria for data suppression for the data systems included in *Healthy People 2010* are published in a previous report.<sup>14</sup>

### **Content of the Disparities Table**

The disparities table for each focus area provides information about disparities between groups for the population-based objectives in that focus area. The objectives are listed on the left-hand side of the table, with the baseline data year for each objective in parentheses. When data beyond the baseline are available, the most recent data year also is included in the parentheses. Characteristics of the population (race and ethnicity, gender, education, income, geographic location, and disability status) are shown across the top of each table, and each characteristic is divided into specific groups. Decisions about which characteristics were selected for each objective were made when the objectives were adopted.<sup>3</sup> Race and ethnicity, gender, and education or income were included for most objectives; geographic location and disability status were included if applicable. Data on sexual orientation were not available for any of the objectives in Healthy People 2010. If a characteristic was not selected for an objective, the corresponding boxes in the disparities table are heavily shaded (as shown in the legend reproduced below). If a characteristic was not selected for *any* of the objectives in a focus area, it is omitted from the table. When data are not available for a characteristic or for a particular group, the corresponding boxes are lightly shaded (see the legend below). In some cases, the data source for an objective provides data for groups that are defined in different ways. For example, some data sources provide data for the black and white populations that include persons of Hispanic origin. These differences are indicated by footnotes in the disparities table. Objectives for which no characteristic-specific data are available are excluded from the disparities table and referenced in a note at the bottom of the table along with objectives that are not population based.



## Measuring Disparities From the Best Group Rate
















Disparities are measured as the percent difference from the best group rate for each characteristic. The group with the best, or most favorable, rate (that also meets an additional criterion specified below) is identified for each characteristic in the table by a “B.” The percent difference for each of the other groups associated with a characteristic is computed as follows:

$$\text{Percent difference} = (R_i - R_B) / R_B \times 100$$

where  $R_B$  is the best group rate for a particular characteristic and  $R_i$  is the rate for any of the other groups of interest for the same characteristic. For example, racial and ethnic disparities are measured as the percent difference between the best racial and ethnic group rate and each of the other racial and ethnic group rates. Gender disparities are measured as the percent difference between the better group rate (male or female) and the rate for the other gender group, and so on.

In rare instances when two groups for a characteristic have identical best rates, both groups are identified by a “B.” To ensure that disparity is measured from a reasonably stable data point, the most favorable group rate must have a relative standard error of less than 10 percent. When the relative standard error for the most favorable group rate is greater than or equal to 10 percent, a small letter “b” is included in the cell and the next most favorable group rate with a relative standard error of less than 10 percent is identified as the reference point. The percent difference is not calculated for cells identified by a small letter “b.” When only one group has a relative standard error of less than 10 percent, a best group is not identified for purposes of measuring disparity, and the cells for all groups with data are blank—indicating that disparity cannot be assessed. When standard errors are not available, the best group is determined by the most favorable rate. The first section of the legend for the disparities table (reproduced below) addresses the identification of the best group rate for each characteristic.

**Figure 1. Legend for the second figure in the focus area chapters**

The <b>best group rate</b> at the most recent data point.	 The group with the best rate for specified characteristic.	 Most favorable group rate for specified characteristic, but reliability criterion not met.	 Best group rate reliability criterion not met.
<b>Percent difference from the best group rate</b>			
<b>Disparity from the best group rate</b> at the most recent data point.	 Less than 10 percent or not statistically significant	 10-49 percent	 50-99 percent
			 100 percent or more
<b>Changes in disparity (percentage points)</b>			
Changes in disparity over time are shown when the change is greater than or equal to 10 percentage points and statistically significant, or when the change is greater than or equal to 10 percentage points and estimates of variability were not available.	<b>Increase in disparity (percentage points)</b>		
	 10-49	 50-99	 100 or more
	<b>Decrease in disparity (percentage points)</b>		
	 10-49	 50-99	 100 or more
<b>Availability of data.</b>	 Data not available.	 Characteristic not selected for this objective.	

To ensure comparability across objectives in the measurement of disparity, dichotomous measures are expressed in terms of adverse events when the percent difference is calculated.<sup>9, 15, 16</sup> The objective is not restated or changed; it is expressed in terms of the adverse event only when the percent difference is calculated for the analyses presented in the disparities table. For example, objective 1-1, to increase the proportion of persons with health insurance, is expressed in terms of the percentage of persons *without* health insurance when the percent difference from the best group rate and the change in disparity over time are calculated.

## Representing the Size of a Disparity by the Color Gradient

In the disparities tables, a color gradient represents the size of the percent difference between each group rate and the best group rate *at the most recent data point*. In some cases, baseline data might be the only data available. The color gradient is shown in the second section of the legend above. When estimates of variability (standard errors) are available, the light pink color indicates a group with a rate that was less than 10 percent higher than the best group rate or a difference that was greater than or equal to 10 percent and not statistically significant at the 0.05 level. The dark red color indicates a group with a rate that was at least 100 percent higher than the best group rate and a difference that was statistically significant. Disparities greater than or equal to 10 percent are coded darker pink and red only when they are significant at the 0.05 level. When standard errors are not available, disparities are graded by size alone.

The statistical significance of the difference between groups can be assessed using the following Z statistic:

$$Z(R_i - R_b) / \sqrt{SE_i^2 + SE_b^2}$$

where  $R_i$  is the rate for a group of interest,  $R_b$  is the rate for the best group,  $SE_i$  is the standard error of the rate for a group of interest, and  $SE_b$  is the standard error of the best group rate.

This formula assumes that the groups are independent. Because the comparison is made to the best rate, measured in terms of adverse events, the other group rate can only be larger; therefore, a one-tailed test is used. If  $|Z| \geq 1.645$ , the difference between the groups is significant at an alpha level of 0.05. If the difference between the rate for a group of interest and the best group rate is significant, the percent difference is considered significant.

## Changes in Disparities Over Time

When data beyond the baseline are available, changes in disparities over time are measured by subtracting the percent difference from the best group rate at the baseline from the percent difference from the best group rate at the most recent data point. The change is expressed in percentage points: Positive differences represent an increase in disparity, and negative differences represent a decrease in disparity.

If the group with the best rate changes over time, the percent difference between the rate for a group of interest and the best group rate at the baseline is subtracted from the percent difference between the same two groups at the most recent data point—except that the group of interest is now the best group rate and the best group rate is now the group of interest. If the difference is positive, the increase in disparity applies to the group that had the best rate at baseline. If the difference is negative, the decrease in disparity applies to the group with the best rate at the most recent data point.

When standard errors are available for a data system, only statistically significant changes between the baseline and the most recent data point are indicated with arrows (see the legend above). Several steps are required to evaluate the statistical significance of a change in the percent difference over time. The percent difference (*PD*) at each point in time is based on the ratio of the simple difference (*SD*) between the rate for the group of interest and the best group rate to the best group rate. The relative standard error (*RSE*) of a ratio is computed based on the *RSE* of the numerator and the denominator. The *RSE* for the *SD* is calculated as follows:

$$RSE_{SD} = \sqrt{SE_i^2 + SE_B^2} / R_i - R_b$$

where  $SE_i$  is the standard error of the rate for a group of interest ( $i$ ),  $SE_B$  is the standard error for the best rate ( $B$ ),  $R_i$  is the rate for a group of interest, and  $R_b$  is the best group rate.

The relative standard error of the rate for the best group is computed as follows:

$$RSE_B = SE_B / R_B$$

The relative standard error for the percent difference  $RSE_{PD}$  is computed based on the relative standard errors of the numerator ( $RSE_{SD}$ ) and the denominator ( $RSE_r$ ) as follows:

$$RSE_{PD} = \sqrt{RSE_{SD}^2 + RSE_r^2}$$

The standard error of the percent difference is obtained from the relative standard error as follows:

$$SE_{PD} = RSE_{PD} \times PD$$

The statistical significance of a change in the percent difference from the best group rate over time at the 0.05 level is assessed using the following  $Z$  statistic:

$$Z = (PD_I - PD_0) / \sqrt{SE_{PD_I}^2 + SE_{PD_0}^2}$$

where  $PD_I$  is the percent difference at the most recent time ( $I$ ),  $PD_0$  is the percent difference at the baseline ( $0$ ),  $SE_{PD_I}$  is the standard error of the percent difference at the most recent time ( $I$ ), and  $SE_{PD_0}$  is the standard error of the percent difference at the baseline ( $0$ ).

When standard errors were available at one point in time but not at the other, statistical tests were performed applying the known standard error to the estimate at the point in time for which standard errors were missing. When standard errors were not available, changes are indicated by arrows based on the size of the change alone.

### Summary Measures

Disparities are measured as the percent difference between the best group rate and other related group rates. When more than two groups are associated with a population characteristic, such as race and ethnicity, income, and education, a summary index provides a way to determine whether the disparity from the best group rate is increasing or decreasing for the set of groups for a population characteristic. The formula for the summary index, also known as the index of disparity,<sup>17</sup> is as follows:

$$\text{Summary index} = \left( \sum_{i=1}^{n-1} PD_i \right) / n - 1$$

where  $PD_i$  is the percent difference from the best group rate for each of the groups of interest ( $i$ ), and  $(n - 1)$  is the number of groups minus one. Because the percent differences are calculated with the best group rate as the reference point, the number of comparisons is equal to the number of groups minus one.

These comparisons are made only when data are available for the same groups defined in the same way at the baseline and the most recent data point.

The statistical significance of a change in the index over time is assessed when standard errors are available for the rates on which the index is based. The magnitude and direction of changes are indicated by arrow symbols as described above. When standard errors are not available for the rates on which the index is based, changes are classified by size and direction without regard to statistical significance.

To obtain a standard error for the index, a type of resampling or “bootstrap” procedure is employed.<sup>9, 18</sup> This procedure uses the rate and standard error for each group to reestimate each group rate 25,000 times, assuming a random normal distribution. Based on these group rates, 25,000 estimates of the index of disparity are generated, and the distribution of these estimates is used to estimate the standard error of the index.

The bootstrap procedure is used to estimate standard errors for the index at the most recent time (*I*) and at the baseline (*O*) to determine whether a change in the index over time is statistically significant. A *Z* test for the change in the index of disparity can be computed as follows:

$$Z = (ID_I - ID_O) / (SE_I^2 + SE_O^2)$$

where  $ID_I$  is the index of disparity at the most recent time (*I*),  $ID_O$  is the index of disparity at the baseline (*O*),  $SE_I$  is the standard error for the index of disparity at the most recent time (*I*), and  $SE_O$  is the standard error for the index of disparity at the baseline (*O*).

Because the value of the index could increase or decrease, a two-tailed test is used with a critical value of  $|Z| \geq 1.96$  at the 0.05 level.

### Estimates of Variability

Estimates of variability (standard errors) are available for most of the population-based objectives in Healthy People 2010. When standard errors are available, they can be used to assess the reliability of the best group rate as described above. This assessment is performed to ensure that the group chosen as the reference point is reasonably stable. Standard errors also are used to perform the tests of statistical significance described above. These tests ensure that observed disparities or changes in disparity do not occur because of sampling error or other random sources of error more than 5 percent of the time.

When standard errors are not available, the variability of the best group rate was not assessed, and tests of statistical significance could not be performed. For objectives based on these data sources, there is no quantifiable assurance that observed disparities and changes in disparity are not due to random variability. As a consequence, more changes in disparity are evident for objectives based on data sources without estimates of variability.

In the disparities tables, objectives based on data for which estimates of variability are available and those for which estimates of variability are not available are designated by footnotes following the baseline and most recent data years in parentheses:

- \* The variability of best group rates was assessed, and disparities greater than 10 percent are statistically significant at the 0.05 level. Changes in disparity over time, noted with arrows, are statistically significant at the 0.05 level.
- † Measures of variability were not available. Thus, the variability of best group rates was not assessed, and the statistical significance of disparities and changes in disparity over time could not be tested.

## DATA2010

DATA2010 is an online, searchable database that contains baseline data, tracking data, and targets for all measurable objectives in Healthy People 2010.<sup>4</sup> The database is updated quarterly to provide the most accurate and up-to-date data for tracking Healthy People 2010 objectives.

DATA2010 allows users to search the database for estimates by focus area, objective, data source, and keyword. In addition, users can access current data by downloading standard or statistical data spreadsheets by focus area. Standard spreadsheets contain rounded estimates, whereas statistical spreadsheets contain rounded data as well as raw data and standard errors (both rounded to one decimal place), when available.

Users can access the Healthy People 2010 midcourse review data by downloading designated static midcourse review standard and statistical tables accessible at <http://wonder.cdc.gov/data2010/ftpselec.htm>. These tables do not reflect postmidcourse revisions or updates or data acquired since January 2005. All of the postmidcourse review revisions and updates are included in the current database selections.

All of the data used to produce the midcourse PQ and disparities charts are reflected in these static midcourse review tables. PQs were calculated using rounded estimates. Measures of disparity were calculated using raw estimates and their associated standard errors, when available.

In addition, DATA2010 contains other technical information related to the Healthy People 2010 objectives at the midcourse, including updated operational definitions for each measure.

## Target Adjustment

### Target Adjustments for Objectives With Revised Baselines

Targets were adjusted for some objectives for which a change was made to the total population baseline data point since the publication of *Healthy People 2010*.<sup>3</sup> Baseline data were changed because of revisions in methodology, survey questions, baseline year, and population denominators. Baseline data for several objectives were revised to accommodate updated public health recommendations. In several cases, baseline data were revised because the published data were based on preliminary analyses. Target revisions were not made in cases in which the baseline data for a select population had changed but data for the total population were unchanged.

Baselines for the majority of objectives for specific causes of death from NVSS were revised from data year 1997 to 1999. These changes were made for two reasons. First, NVSS implemented the 10th revision of the International Classification of Diseases (ICD) with data year 1999, creating a discontinuity in cause-specific death data between 1999 and previous years. In addition, as of data year 1999, the standard population used for death age adjustment changed from the 1940 to the 2000 standard million

population, creating a second discontinuity with previously published death data.<sup>19</sup> The revision of the death baselines to 1999 avoided the discontinuities associated with the ICD and the age-adjustment changes. More information about the impact of the ICD revision and the new age-adjustment standard is available in *Tracking Healthy People 2010*.

Several general methodologic changes for NHIS occurred since the launch of Healthy People 2010. These changes included the imputation of missing values for family income using multiple imputation methodology, revised standard error methodology, and population weights based on the 2000 census. These changes required baseline revisions to objectives using NHIS as a data source.

Baseline data for 145 objectives or subobjectives were revised since the publication of *Healthy People 2010*. New targets were calculated using the following criteria:

1. Targets based on percent improvement were revised using *original* percent improvement (PI). Depending on the desired direction of the objective, the PI can be positive or negative. This value was based on the original baseline for the total population and the original target (unless otherwise noted below in the discussion of special cases).

$$PI = (\text{original target} - \text{original baseline}) / \text{original baseline} \times 100$$

$$\text{Revised target} = (PI / 100 \times \text{revised baseline}) + \text{revised baseline}$$

2. Targets based on better than the best (BTTB) racial or ethnic group were revised using the *original* percent improvement (PI) from the *original* best racial or ethnic (R/E) group at baseline applied to the *revised* best R/E group. Using the formula for the PI above:

$$PI = (\text{original target} - \text{original best R/E group}) / \text{original best R/E group} \times 100$$

$$\text{Revised target} = (PI / 100 \times \text{revised best R/E group}) + \text{revised best R/E group}$$

3. Targets based on the designations “total elimination/coverage,” “consistent with another program,” or “retain Healthy People 2000 target” were not revised (unless noted below in the discussion of special cases).
4. Developmental objectives and subobjectives that recently became measurable did not require target adjustment.

### **Corrections From the Original *Healthy People 2010* Publication and Special Cases**

1. One subobjective (9-10a) used a target *equal to* the best group instead of the BTTB group. The revised target was recomputed using one unit BTTB.
2. Seven objectives or subobjectives had a calculated percent improvement that did not match the published percent improvement (5-5, 5-10, 14-1k, 14-13, 16-14b, 21-14, and 26-12). The revised targets were recomputed using the calculated percent improvement.
3. Two subobjectives (14-20b and 16-14b) had a calculated percent improvement that did not match the published percent improvement. The intent of objective 14-20 was to use 10 percent



improvement for all subobjectives within the objective; for objective 16-14, a 5 percent improvement was intended. The revised targets for these subobjectives were recalculated using 10 percent and 5 percent improvement, respectively.

4. Three objectives or subobjectives (3-14, 18-9b, and 21-14) had revised targets that exceeded 100 percent or 50 States and the District of Columbia. These targets were set to 100 percent or 50 States and the District of Columbia.
5. Three objectives, previously based on percent improvement, are now based on one unit BTTB racial or ethnic group because template data are now available (17-6, 18-4, and 27-12).
6. Three objectives or subobjectives that originally used BTTB have been changed to percent improvement because the revised template has less than two racial and ethnic populations (14-9, 15-30, and 24-1a).

## **Tracking Healthy People 2010**

*Tracking Healthy People 2010* is a comprehensive guidebook on the statistics used for Healthy People 2010.<sup>12</sup> It provides detailed information on how the data are derived and the major issues affecting the interpretation of the statistics. The guidebook ensures greater accuracy and comparability in the data produced for and used by Healthy People 2010 programs at the local, State, and national levels.

During the Healthy People 2010 midcourse review, the three parts of *Tracking Healthy People 2010* described below were updated.<sup>20</sup>

### **Part A: General Data Issues**

This section discusses issues that affect multiple objectives. Topics covered include measuring years of healthy life; measuring health disparities; population estimates; the Healthy People 2010 population templates, including issues related to the revised Federal standards for classifying race and Hispanic origin; issues related to target setting and target adjustment; age adjustment, including implications of changes in the standard population for age adjustment; the ICD used for illness and death classification; State, local, and national data issues; and DATA2010.

### **Part B: Operational Definitions**

This section provides definitions for each of the Healthy People 2010 objectives. The purpose of these definitions is to give the necessary technical information so that the statistics can be reproduced for the national populations and comparable statistics can be calculated for other populations. If complete information for an objective definition was not available at the time of publication, the reader is directed to experts who can provide additional information.

### **Part C: Major Data Sources**

Data to track the national Healthy People 2010 objectives come from 168 data sources. Of these, 21 data sources are used to track 5 or more objectives or 10 or more objectives and subobjectives. These 21 sources are used to track more than three-fifths of the Healthy People 2010 objectives. Part C provides a technical summary of the important characteristics of each of the major data sources, including a brief description of the sample design, sample size, response rates, periodicity, survey content, and geographic coverage. References to more detailed technical information also are provided.

The appendices of the updated *Tracking Healthy People 2010* provide information on the following:

- The Healthy People 2010 workgroup coordinators.
- Abbreviations and acronyms used in Healthy People 2010.
- ICD-10 codes for cause-specific death objectives.
- ICD-9-CM codes for cause-specific illness objectives.
- A list of the Healthy People 2010 objectives that are leading health indicators.<sup>3</sup>
- A list of objectives included in *Steps to a HealthierUS*.<sup>19</sup>

Appendices on baselines for age-adjusted death objectives using rates age adjusted to 1940 and 2000 standards and on crosswalks between the Healthy People 2000 and Healthy People 2010 objectives (previously included in the original *Tracking Healthy People 2010* publication) were not included in the revised *Tracking Healthy People 2010* publication.

The revised *Tracking Healthy People 2010* publication is accessible from the Healthy People 2010 website at [www.cdc.gov/nchs/hphome.htm](http://www.cdc.gov/nchs/hphome.htm).

## References

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- <sup>20</sup> *Tracking Healthy People 2010* is accessible from the Healthy People 2010 website at [www.cdc.gov/nchs/hphome.htm](http://www.cdc.gov/nchs/hphome.htm).